

# Modeling potential responses to smallpox as a bioterrorist weapon

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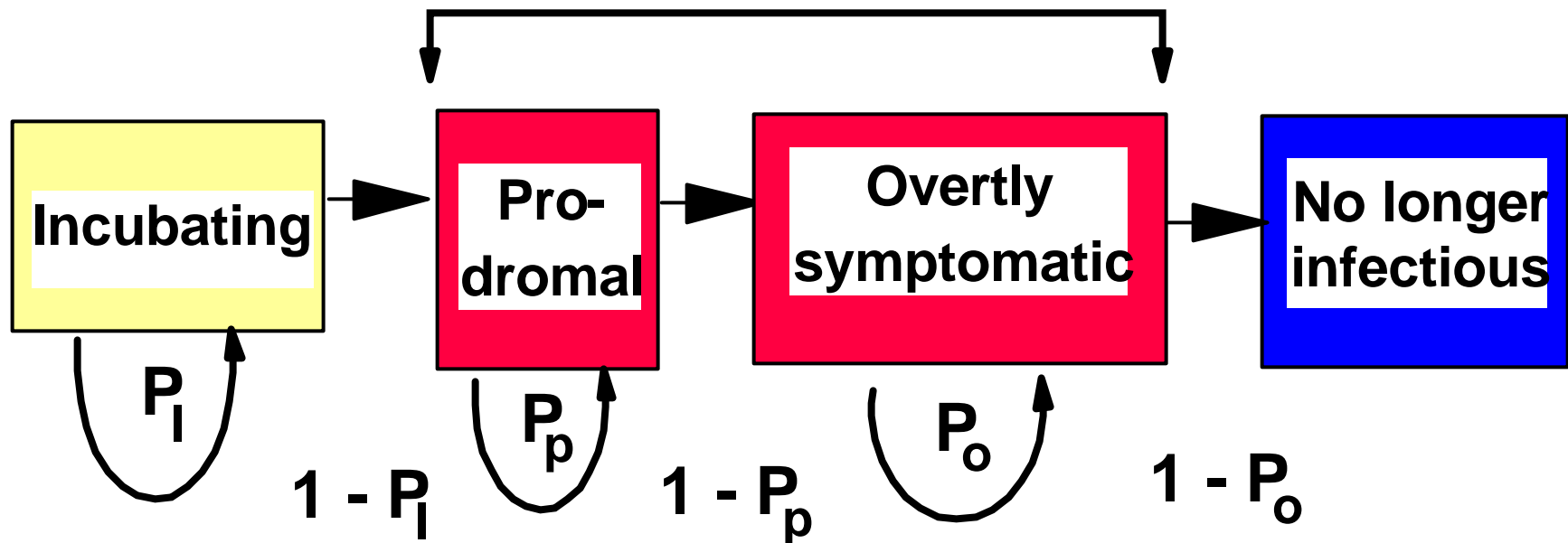


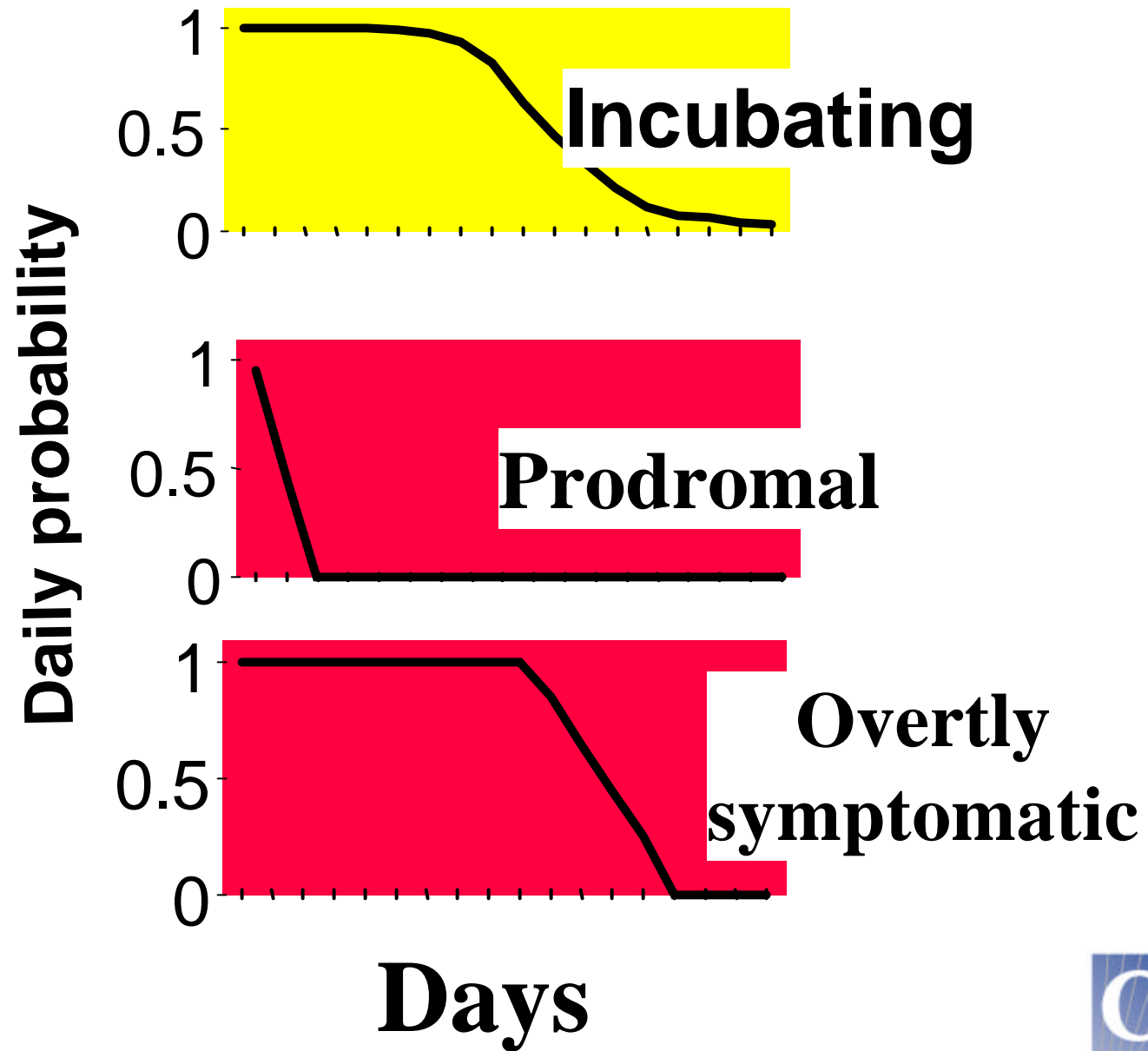
# The problem

- ▶ **Smallpox - potential weapon**
- ▶ **Effectiveness of potential interventions**
  - ▶ **Vaccination & quarantine**
- ▶ **Number of doses need for stockpile**

# The Model

Period of infectivity:  
transmission occurs



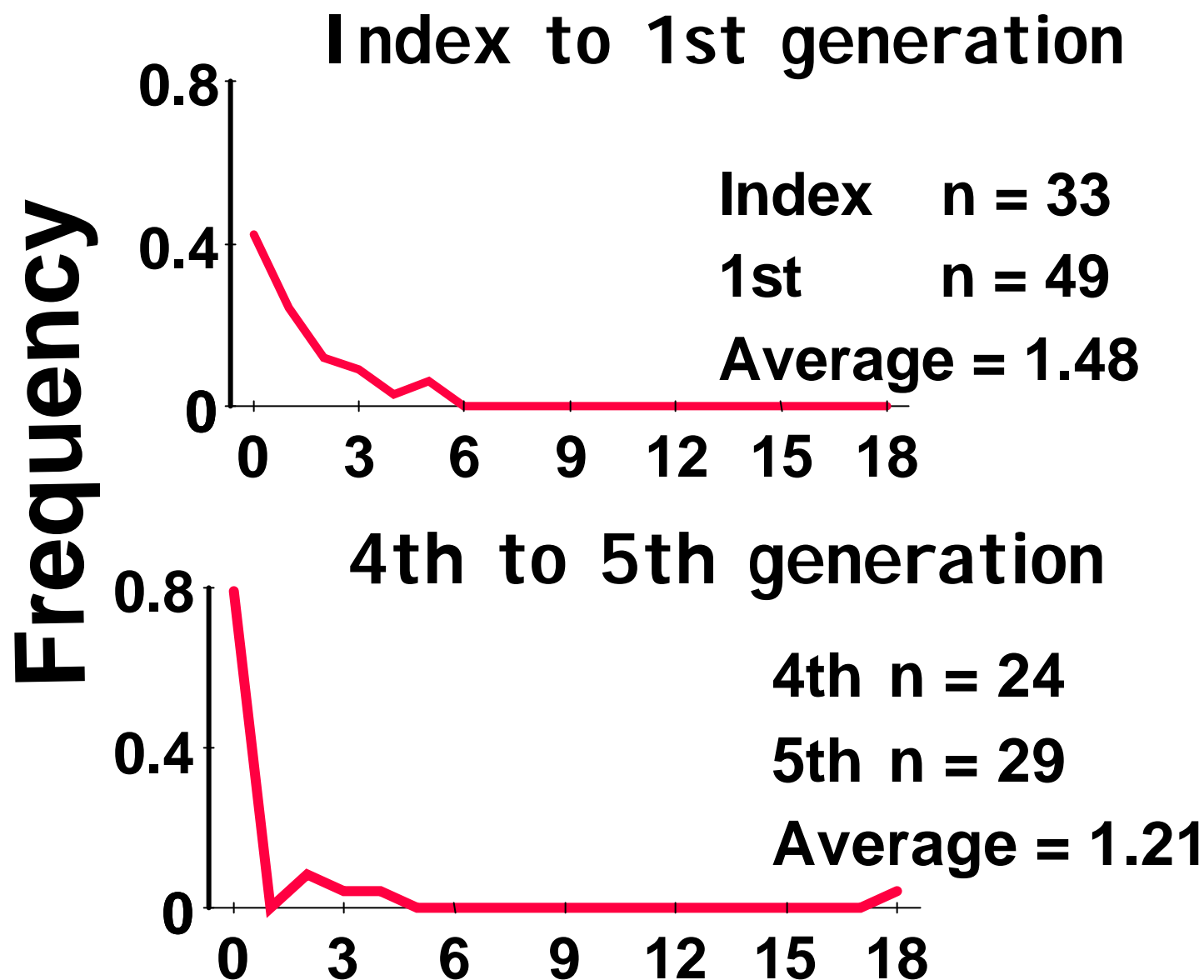


# Transmission rate: Impact on total cases

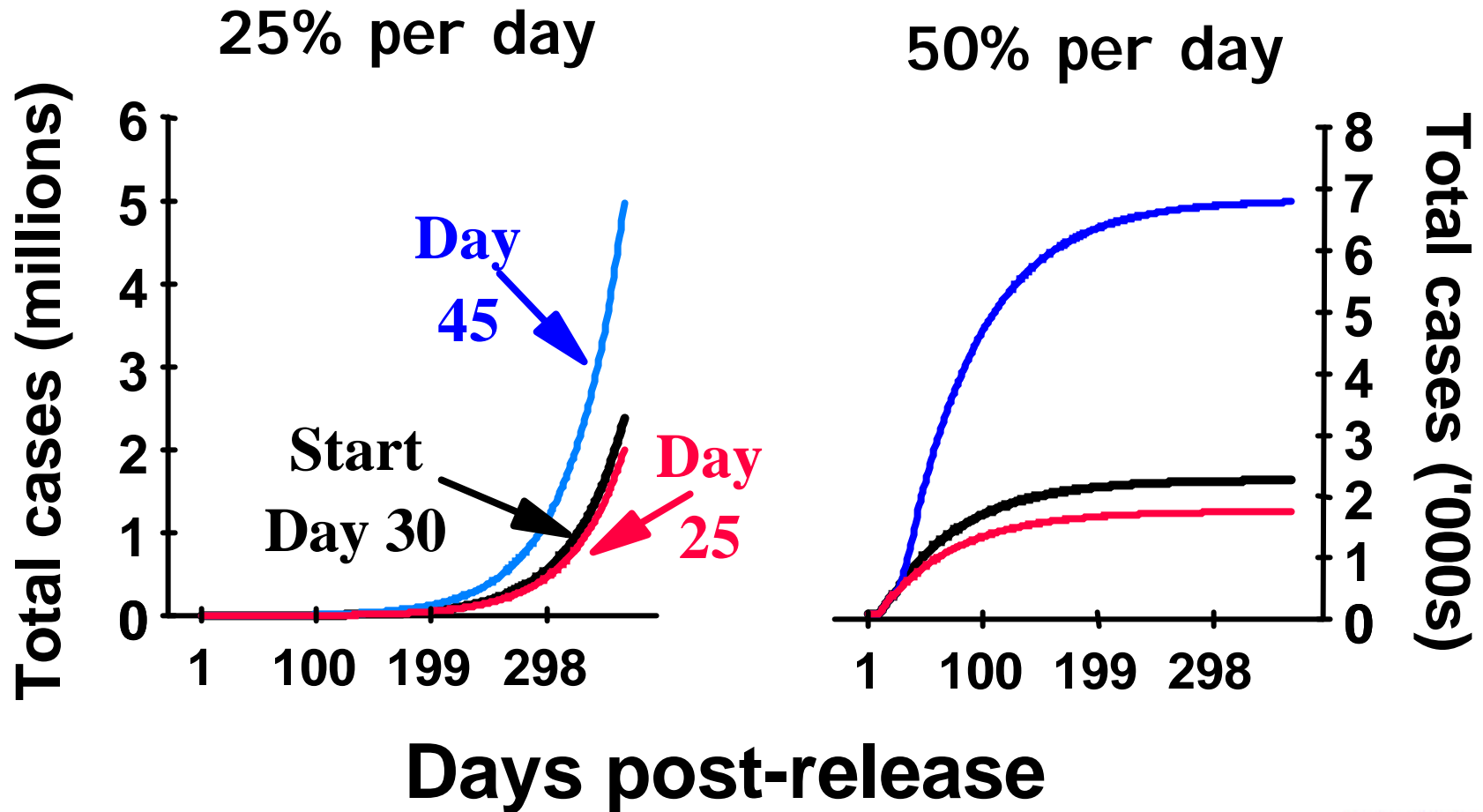
# initial infected	Transmission	Total cases
10	1.5	224 thousand
10	3	774 billion
100	3	8 trillion

Assume: 100 initially infected

Assume: Transmission rate of 3



# Results: Quarantine only



25%: entire in 17 days, 90% in 9 days

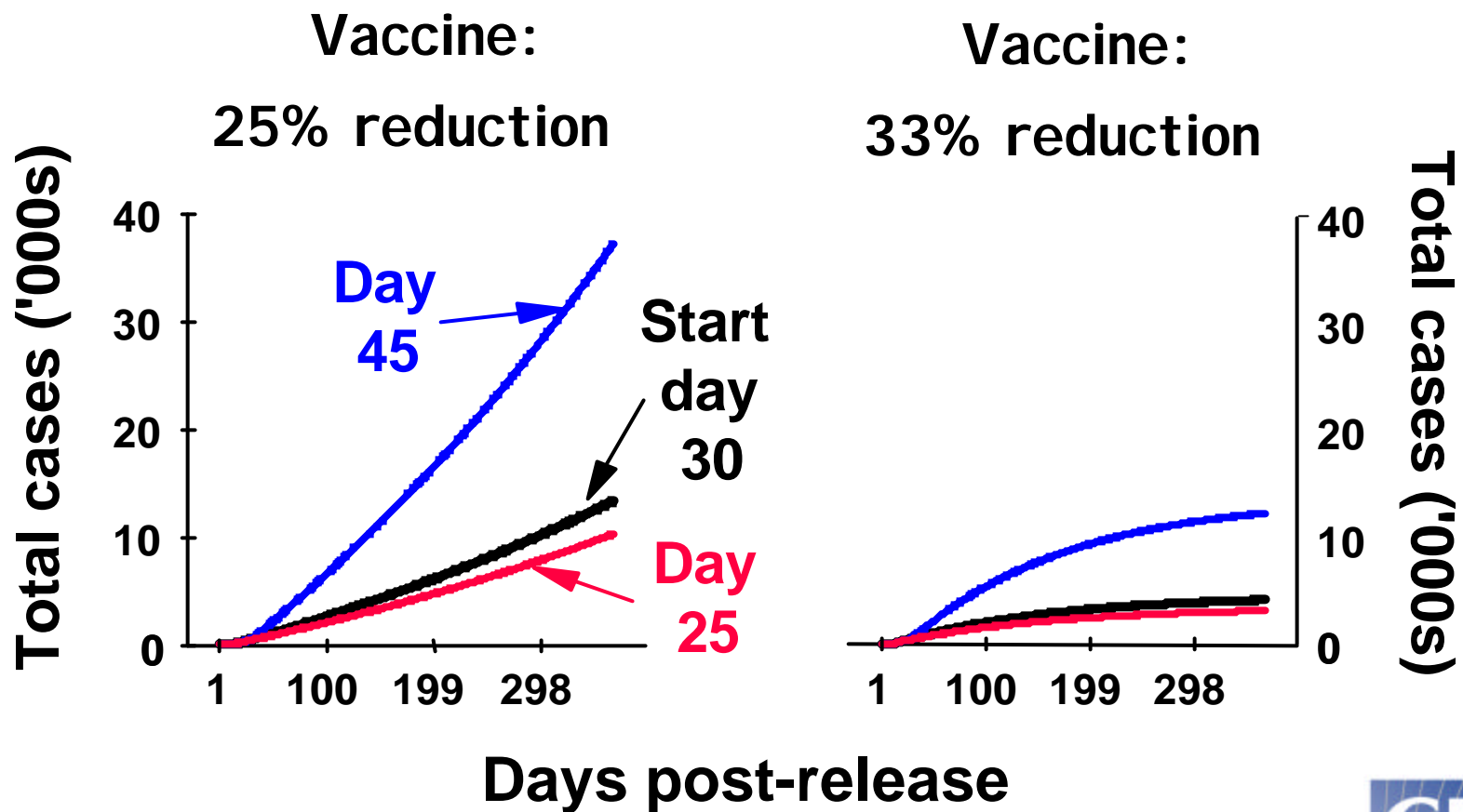
50%: Entire 7 days, 90% in 4 days

Assume: 100 initially infected

Assume: Transmission rate of 3



# Results: Vaccination + Quarantine





# Results:

## Sensitivity analyses

# infected	Trans.	Quarantine	Vaccine	Total cases
100	3	25%	33%	4240
100	2	10%	25%	10512
100	5	25%	33%	54.5 million

# Results: Doses per case

<u>Site</u>	<u>Yr</u>	<u>Suscept</u>	<u>Cases</u>	<u>Doses per case</u>
India	1968	8%	40	34
Brazil	1969	57%	246	9
Botswana	1973	27%	30	1,667
Yugo.	1972	n/a	175	102,857
Cardiff	1962	n/a	47	<u>19,148</u>
		N = 14	Mean	14,411
			Med	2,511



# Results: Doses in stockpile

	Trans. rate: 3	Trans. rate: 2
# of cases	4,200	1,548
Start	Day 30	Day 45
Initial infected	100	100
Median doses	9 million	3 million
95th percent	29 million	11 million
5th percent	15 thousand	5 thousand

# Conclusions

- ▶ **M.I.V. = Transmission rate**
  - ▶ 3 infected per infective - very high
- ▶ **Need quarantine + vaccination to control**
  - ▶ Need 3 P's - stockpile alone inadequate
- ▶ **40 million dose stockpile - adequate**
- ▶ **Costly if delay in response**
  - ▶ May take 150 days to stop outbreak

# Something to avoid

“The whole aim of practical politics is to keep the populace alarmed, and hence clamorous to be led to safety, by menacing it with an endless series of hobgoblins, all of them imaginary”

H.L. Mencken